

## REMARKS

In view of the objections to the Specification set forth in the Official Action of October 7, 2002, a Substitute specification is submitted herewith which, it is submitted, meets the objections to the Specification as set forth in the Official Action.

Claims 1, 2, 43 and 44 were rejected under 35 U.S.C. §102 as being anticipated by U.S. Patent No. 5,740,757, of April 21, 1998, to Smeester. This patent is directed to a method and apparatus for feeding and performing certain procedures on a herd of bison, known also as American buffalo.

By this Amendment, Claims 1, 2, 43 and 44 have, in effect, been replaced by Claims 51-54. However, except for the style of the claims which is, in the new claims, somewhat more specific and the fact that the herd of animals involved has been designated as a "domesticated" herd of animals, the new claims are essentially the same as the cancelled claims.

As pointed out in the Official Action, the Smeester reference discloses an arrangement for managing a herd of animals which includes an animal identification system as well as a central unit and a computer having a memory. However, although it is stated in the Official Action that the memory is adapted to contain data for each buffalo in relation to its place in the hierarchic order and that the computer includes hierarchic order determining means, disclosures of same in the Smeester reference have not been found. In addition, it is submitted that Smeester leads away not towards Applicants' invention. Attention is thus invited to the statement in column 2, lines 5 and 6, that while a domestic animal may placidly share hay or feed supplements, bison are inherently different animals.

The instant invention is directed to the use of the hierarchic order of a herd as a management tool. Whereas Smeester certainly recognizes that bison herds include dominant

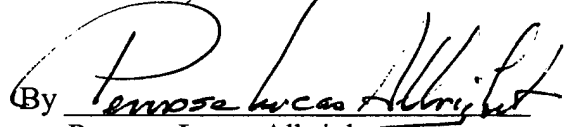
animals which claim excessive portions of feed when deposited on the ground and, indeed, intentionally separates the feed troughs or containers so that the individual bison do not see each other, there does not appear to be anything in the disclosure of the reference wherein Smeester's method and apparatus utilize the herd's hierarchic order as a management tool. Accordingly, it is submitted that the claims, as presently submitted, are not anticipated by Smeester under 35 U.S.C. §102 and also the reference does not teach modifications or adaptations which are suitable for rejecting the instant Application under 35 U.S.C. §103.

Further consideration and reexamination of this Application, in its amended form, is requested in view of 35 U.S.C. §132 and regulations in implementation thereof. It is submitted the Application in its amended form is free from ambiguity and avoids the references of record. It is further submitted the Examiner should have no difficulty in finding that the differences between the subject matter sought to be patented in this Application and prior art and usage within his expert knowledge are such that the subject matter as a whole would not have been obvious at the time the invention was made to persons having ordinary skill in the art to which the subject matter of this Application pertains.

In view of the foregoing, the allowance of claims as now presented is earnestly solicited.

Respectfully submitted,

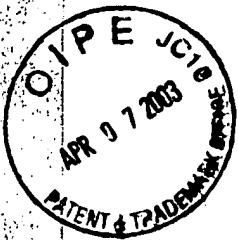
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AN ARRANGEMENT FOR AND A METHOD OF MANAGING A HERD OF ANIMALS  
FIELD OF THE INVENTION:

The invention relates to an arrangement for managing a herd of animals, said arrangement comprising an animal identification system.

BACKGROUND OF THE INVENTION:

Such an arrangement is generally known. Although <sup>the</sup> such an arrangement functions satisfactorily and ~~takes over~~ <sup>relieves a doing farmer</sup> a considerable amount of much time-consuming work ~~from a farmer~~, in practice there appears to be a need for an improved arrangement, <sup>because</sup> ~~for it has~~ <sup>may occur</sup> appeared that there may be, for example, a great difference in waiting time for admitting ~~an~~ animals to a certain area.

It is an object of the invention to provide an arrangement for managing a herd of animals that <sup>provides</sup> ~~enables an~~ improved management.

SUMMARY OF THE INVENTION:

For that purpose an arrangement of the above-described type according to the invention comprises <sup>providing a control unit with a computer having</sup> a memory which includes data relating to the hierarchic order of animals in a herd. ~~measures mentioned in the characterizing part of claim 1.~~ The invention is based on the insight that not only the arrangement for managing a herd is active for managing the herd, but that also the animals of the herd themselves participate in the management. In this connection especially the hierarchic order appears to play an important part. It occurs for example that a dominant animal pushes other animals away and is for example the first to take fodder.

With dairy animals it often appears that a dominant animal wishes to be the first to enter a milk <sup>ing compartment</sup> ~~box~~ and that other dairy animals are pushed away by this dominant animal. By this partially self-managing behavior of the animals of the herd the management carried out by the arrangement may be negatively influenced, which is not only undesirable for less dominant animals (undesired increase of waiting time for these animals), but also for the efficiency of the arrangement, for example when it comprises a milking robot. By taking into account, according to the invention, the hierarchic order within the herd, ~~there can be taken~~ measures

*can be taken*

for providing an improvement both for the animals of the herd and the production of the arrangement.

In an embodiment an arrangement according to the invention is characterized in that there is provided a  
 5 hierarchic order determining means for determining data in relation to the hierarchic order, said hierarchic order determining means supplying the determined data in relation to the hierarchic order to the memory that stores these data. Such a hierarchic order determining means may be constituted  
 10 by the animal identification system, a camera or the like, possibly in combination with a computer. Due to this the arrangement generates itself the data in relation to the hierarchic order. Preferably the data are updated in the memory.

15 The herd is preferably managed by the arrangement at least with the aid of the data regarding the hierarchic order.

Although in general dominant animals try to be the first to gain access to an area or to obtain fodder, in some  
 20 cases it may occur that dominant animals are the last to gain access, precisely because <sup>the first desire of</sup> these dominant animals <sup>is</sup> ~~first wish~~ to dominate all the other animals. This behavior is also called "jostling behavior" and is present, as every farmer knows, to a greater or lesser extent with each animal. By not  
 25 only taking the hierarchic order but also the jostling behaviour into account, it is possible to obtain an optimally functioning arrangement. In an embodiment of an arrangement according to the invention this is achieved in that the memory is adapted to contain ~~per animal~~ <sup>for each animal</sup> data, in relation to  
 30 the jostling behavior. The herd is preferably managed by the arrangement at least with the aid of the data regarding the jostling behavior.

If desired, the central unit <sup>may comprise</sup> an input means for inputting per animal ~~etc.~~ <sup>for example</sup> by a farmer, data about  
 35 the hierarchic order <sup>and</sup> ~~respectively~~ about the jostling

behavior. Additionally or alternatively these data may be generated by the arrangement itself.

In particular it has appeared that in the vicinity of gates the circulation may be negatively influenced by dominant, jostling animals. In an embodiment of an arrangement according to the invention said circulation can be improved when the arrangement is provided with an area for containing a number of animals, said area having an entrance gate ~~respectively~~ <sup>and</sup> an exit gate, the operation of at least one of the gates being controlled at least with the aid of data from the memory.

In order further to promote the circulation said area is preferably provided with at least two, possibly juxtaposed, entrance gates ~~respectively~~ <sup>and</sup> exit gates. As a result thereof the animals are enabled to choose another gate than that <sup>wherein</sup> ~~whose~~ passage is obstructed by a jostling animal.

The invention is in particular advantageously applied to an arrangement in which the area is constituted by a treatment area.

The treatment area is preferably constituted by a milking ~~parlour~~ <sup>compartment</sup> provided with a milking robot. Precisely in the situation of a milking ~~parlour~~ <sup>compartment</sup> provided with a milking robot the dominant ~~respectively~~ <sup>and</sup> the jostling behavior may play an important part. Owing to the natural instinct of dairy animals to be milked, an animal may experience extremely much stress when it is prevented by a jostling animal from entering the milking ~~parlour~~ <sup>compartment</sup>, which has a negative influence on the health of the dairy animal. Moreover, it may negatively influence the milk production. In an embodiment of an arrangement according to the invention, said disadvantageous behavior is prevented at least for the greater part when in front of the entrance gate ~~respectively~~ <sup>or</sup> the entrance gates of the milking ~~parlour~~ <sup>compartment</sup> ~~there is provided~~ <sup>is provided</sup> a further area having at least one entrance gate for containing a limited number of animals.

In order not to prolong unnecessarily the waiting time for dairy animals to enter the milking robot, an embodiment of an arrangement according to the invention is characterized in that the arrangement comprises a detection device for detecting animals in the further area and for issuing a detection signal, ~~a~~ <sup>the</sup> detection signal indicating that animals are present in the further area keeping the entrance gate of the further area closed. As a detection device the animal identification may be used. As a result thereof first all the animals present in the further area are ~~given the~~ <sup>provided an</sup> opportunity to enter the milking ~~robot~~ <sup>arrangement</sup> before new animals are admitted to the further area.

Further it has appeared that at feeding stations the eating behaviour of certain animals may negatively be influenced by ~~any~~ <sup>dominant</sup> dominant, jostling animals. Therefore, the invention can in particular be applied advantageously to an arrangement provided with a feeding station with a feeding trough, an entrance opening to the feeding trough, a closing means for closing the entrance opening, and a feed supplying device for ~~intermittently~~ <sup>or both</sup> supplying an amount of fodder ~~and/or~~ <sup>and/or</sup> drink into the feeding trough, the feeding trough being adapted to be closed at least with the aid of data from the memory.

~~For realizing an~~ <sup>To obtain</sup> optimal feeding of the animals of the herd, an embodiment of the arrangement according to the invention is characterized in that the arrangement comprises a feeding station with several juxtaposed feeding troughs, each feeding trough being adapted to be closed at least with the aid of data from the memory. When for example it is detected that an animal eating from a feeding trough is pushed away, the feeding trough can be closed. The animal that pushes away can then no longer obtain fodder from the relevant feeding trough and will soon leave said feeding trough, so that another animal, in particular the animal that has been pushed away, can regain access to the feeding trough

by controlling the operation of the closing means by the computer with the aid of the data obtained from inter alia the animal identification system.

In a preferred embodiment of an arrangement according to the invention, the arrangement is provided with a detection device for determining the quantity of feed present in the feeding trough at a point of time after the supply of a quantity of fodder ~~and/or~~ <sup>or both to the trough</sup> drink, <sup>base</sup> and for issuing a first signal for operating the closing means ~~in dependence of~~ <sup>ON</sup> the result of the quantity determination. It has appeared that animals having made use of the feeding trough, even after there is no more feed present therein, still keep their heads in the feeding trough <sup>for</sup> during a short to a longer period of time <sup>while</sup> waiting for additional feed that may still be supplied. As a result thereof another animal that is ready to be fed cannot gain access to the feeding trough immediately. According to the invention this is prevented by operating, after an animal has <sup>consumed</sup> ~~eaten~~ at least a part of the quantity of fodder ~~and/or~~ <sup>or both</sup> drink, <sup>that is</sup> the closing means, ~~ie.~~ by moving the closing means into the closing position, so that further access to the feeding trough is impossible for that animal. An animal that has just made use of the feeding trough is thus <sup>inclined to move away from</sup> ~~urged to release the~~ entrance to the feeding trough.

The detection device preferably comprises a weighing device for weighing the quantity of feed present in the feeding trough. Said weighing device <sup>communicates</sup> ~~enables to measure~~ whether or not there is feed present in the feeding trough. As a result thereof it is possible for the weighing device, <sup>for example</sup> after detecting that there is no more feed present in the feeding trough, to issue a signal <sup>which causes</sup> ~~for the operation of~~ the closing means <sup>to</sup> ~~for closing~~ the feeding trough.

When the detection device <sup>includes</sup> ~~comprises~~ a clock, it is possible to measure how long the quantity of feed in the feeding trough remains untouched. By setting, <sup>for example,</sup> ~~with~~ an upper limit, after said upper limit has elapsed, <sup>that is</sup> ~~ie.~~ after a

period of 6

predetermined threshold, time has elapsed, the clock can issue a first signal for causing the closing means to close. In particular when data from the weighing device and the clock are combined, an extremely efficient use of the feed metering device is possible.

In a preferred embodiment the arrangement is provided with a clock for determining the duration from the supply of a quantity of fodder ~~and/or~~ <sup>or both</sup> drink, and for issuing, ~~in dependence of the result of the determination of the~~ <sup>based on</sup> duration, a second signal for operating the closing means. The arrangement is preferably provided with a closing means operating device for operating the closing means on the basis of the first ~~and/or~~ second signal, <sup>or both</sup>.

An embodiment of an arrangement according to the invention is provided with a device for detecting jamming for the closing means. This prevents an animal from being injured during closing of the entrance opening to the feeding trough.

There is preferably provided an obstacle detector for detecting an obstacle in the entrance opening. Such an obstacle detector is preferably adapted to distinguish animals and other objects from each other.

~~It has appeared that~~ <sup>which</sup> animals, after having taken the quantity of fodder, <sup>may</sup> knock or kick ~~with force against the~~ <sup>with force</sup> feeding trough or a construction supporting same <sup>for trying</sup> to obtain additional fodder. According to the invention this undesired behavior is prevented by providing an anti-violence detector. When said anti-violence detector, which may comprise, <sup>for example,</sup> a vibration detector, detects that ~~there is~~ <sup>the feeding trough has been</sup> knocked or the like, ~~against the feeding trough, said detector~~ <sup>it</sup> issues a signal for operating the closing means for closing the feeding trough.

Preferably the feeding station is further provided with an animal identification device for identifying a particular animal that visits the feeding unit. Such an animal identification device can be used extremely



advantageously for supplying a quantity of fodder ~~and/or~~<sup>or both</sup> drink to the feeding trough, ~~with the aid of data from the animal identification device~~. With the aid of data from the animal identification device, the operation of the closing means is controlled in an advantageous manner so that it is possible to forbid a particular animal to enter the feeding trough. ~~Just~~<sup>Because</sup> the animal identification device is adapted to identify a particular animal, ~~said device is an~~<sup>abstracting</sup> particular suitable for holding back an animal, ~~wishing to~~<sup>from using the feeding trough that</sup> make use of ~~the feeding trough~~ at an undesired point of time. Moreover, the animal identification device is adapted to co-operate with the obstacle detector for obtaining an extremely efficient functioning of the obstacle detector.

An arrangement according to the invention is in particular characterized in that there is provided a device for issuing a warning signal indicating that the closing means is going to close. In this manner an animal ~~knows when~~<sup>made aware that</sup> the closing means is going to close and thus it is possible to ~~teach~~<sup>teach</sup> the animal to leave the feeding trough at the issue of the warning signal, ~~as~~<sup>which may be, for example,</sup> a sound or a light signal.

Not only jostling animals may cause a disturbance of the normal order of things at a feeding station, but also so-called "gourmets" may cause a disturbance. A gourmet is an animal that goes from one feeding trough to another and each time only takes a small quantity of fodder (usually the best part). Such a disturbance is avoided in an embodiment of an arrangement according to the invention because of the fact that the computer is programmed in such a manner that the closing means of a third feeding trough is operated when the data in the memory indicate that, within a predetermined period of time, an animal has taken less than a first quantity of fodder from a first feeding trough, and less than a second quantity of fodder from a second feeding trough. The first ~~and/or~~<sup>or both</sup> quantity, preferably amount ~~ing~~<sup>ing</sup> to 0.75 ~~kg~~<sup>kilo grams</sup>, while the period of time preferably amounts to ~~15~~<sup>15</sup> minutes.

The arrangement is preferably provided with a camera for observing the behavior of an animal. By means thereof and by means of other devices, such as the animal identification system, the data in the memory can be updated.

5 In order to be able to influence the behavior of dominant, jostling animals and to promote the management of the herd, the arrangement is provided with means of punishment for punishing animals impeding the management of the herd. Such means of punishment may preferably comprise  
10 loudspeakers, punishment means that are adapted to <sup>use</sup> ~~be put~~ <sup>an</sup> ~~under~~ electric <sup>voltage</sup> ~~sensing~~ or blowing means or the like.

It is particularly advantageous when the means of punishment comprise a punishment device that is movable from an invisible to a visible position. The punishment device is  
15 preferably constituted by an inflatable object <sup>which, for example, may be</sup> ~~etc.~~ in the form of a cow, a wall or the like; a picture showing a frightening image; a partition wall or guide wall or the like.

It is particularly efficient when the means of  
20 punishment comprise a vehicle moving forward automatically. Said vehicle may for example be controlled by cameras and image recognition programs. However, a particularly accurately functioning vehicle is obtained when the animals are provided with an animal identification adapted to be  
25 detected by a positioning system for determining the position of the animal, and when the vehicle moving forward automatically is controlled at least with the aid of data from the positioning system. As a positioning system GPS may, <sup>used</sup> ~~for example, be taken into account.~~

30 The disadvantage of jostling behavior for other animals can be obviated when the means of punishment comprise a punishment path that can be reached via an exit gate, so that the jostling animal is not rewarded for its behavior.

The invention also relates to a method of managing  
35 a herd of animals, in which method a number of automatic

animal related <sup>procedures</sup> ~~treatments~~ are performed, characterized in that the method comprises the step of determining the hierarchic order of an animal.

The performance of at least one of the automatic animal related <sup>procedures</sup> ~~treatments~~ is preferably controlled at least on the basis of the determined hierarchic order of an animal.

An embodiment of a method according to the invention comprises the step of determining the jostling behavior of an animal, the performance of at least one of the automatic animal related <sup>procedures</sup> ~~treatments~~ being controlled at least on the basis of the determined jostling behavior of an animal.

The animal related <sup>procedures</sup> ~~treatment~~ comprises, in particular, opening <sup>or</sup> ~~respectively~~ closing <sup>or</sup> ~~or~~ a gate. The animal related <sup>procedures</sup> ~~treatment~~ preferably comprises <sup>providing</sup> ~~giving~~ access to a feeding trough.

The determination of the hierarchic order of the animals preferably takes place initially by manual input of data based on experience.

Alternatively or additionally the hierarchic order <sup>or</sup> ~~respectively~~ the jostling behavior is determined and ~~then~~ updated by determining the order in which animals of a herd enter ~~respectively~~ leave an area.

It is advantageous when the hierarchic order <sup>and</sup> ~~respectively~~ the jostling behavior <sup>are ascertained</sup> ~~is determined and/or~~ updated, by determining the order in which animals of a herd make use of a feeding ~~station~~ or drinking station.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be elucidated hereinafter by way of example with reference to the drawing, in which:

Figure 1 shows a schematic plan view of an arrangement according to the invention;

Figure 2 shows a part of a feeding station in an embodiment of an arrangement according to the invention, and

Figure 3 shows a part of a feeding station in an alternative embodiment of an arrangement according to the invention.

# DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 shows a schematic plan view of an arrangement according to the invention comprising a shed 1 for containing a herd of animals. ~~The~~ Shed 1 comprises inter alia a number of cubicles 2, feeding stations 3a, 3b, a milking ~~parlour~~ <sup>compartiment</sup> 4 with ~~4~~ milking robots 5, and a further area (waiting area) 6.

The arrangement is further provided with an animal identification system ~~known per se.~~ <sup>which</sup> Said animal identification system <sup>11, 12, 13, 14 and</sup> comprises reading units 10, 15 for reading the animal identification <sup>device</sup> worn by an animal, in particular a cow. As known, data from the animal identification are centrally stored by a central unit 7 provided with a computer 8 having a memory 9 containing several memory files. ~~The~~ Central unit 7 centrally controls the functions of the arrangement.

The waiting area 6 has a number of entrance gates 16, 17, 18 (in the embodiment shown three). In the case that the entrance gates 16, 17, 18 are <sup>side-by-side, as shown</sup> juxtaposed, there may be disposed partitions 19, 20. <sup>and</sup> The waiting area 6 further has a number of exit gates 21, 22, 23 (in the embodiment shown three). One ~~of~~ <sup>as indicated by reference number 23</sup> of these exit gates constitutes at the same time an entrance gate <sup>into</sup> ~~of the~~ milking <sup>compartiment</sup> parlour 4. There are further provided selection gates 24, 25 by means of which animals coming from the other exit gates 21, 22 <sup>and</sup> ~~can possibly~~ <sup>may</sup> be guided to ~~the~~ milking <sup>compartiment</sup> parlour 4. ~~The~~ Exit gate 21 and a selection gate 26 can also give access to a punishment path 27 in which a waiting gate 28 <sup>may be</sup> ~~is possibly~~ provided. <sup>and</sup>

In the embodiment shown, each feeding station 3a, 3b has several, <sup>side-by-side, as shown,</sup> ~~possibly~~ juxtaposed, feeding troughs 32. A feeding station having <sup>however,</sup> only one feeding trough can also be applied within the scope of the invention. Each feeding

trough 32 is provided with a closing means ~~known per se~~ for closing the entrance to the feeding trough.

According to the invention, ~~the~~ memory 9 is provided *for each* animal of the herd with data in relation to the hierarchic order of the animal ~~in the herd~~. These data can initially be inputted with the aid of the data based on experience ~~as known to the farmer~~. *Possibly additionally, and data for each* when known, there can be inputted ~~per animal data~~ in relation to ~~the~~ jostling behavior into the memory. However, the data in relation to hierarchic order and jostling behavior can also automatically be generated and updated by the arrangement.

The functioning of the arrangement according to the invention will be explained in further detail with reference to the entrance to ~~the~~ milking *compost man* parlor 4 and the operation of the feeding stations 3a, 3b, in particular the operation of the closing means for the feeding troughs. However, it will be ~~obvious~~ *appreciated* that the invention is not limited to these two examples, but may be applied to all automatic animal related ~~treatments~~ *procedures* that are customary in managing a herd of animals.

When dairy animals wish to make use of ~~the~~ milking robot 5 in the milking *compost man* parlor 4, they first have to enter the waiting area 6 via one of the entrance gates 16, 17, 18. When one of the entrance gates is blocked by a dominant, jostling animal, another animal can use one of the other two entrance gates. A reading unit 12 detects which cow is present at which gate. With the aid of data regarding the hierarchic order (and data regarding the jostling behavior, if any), and data regarding the history of the animal to be milked, the central unit 7 is enabled to control the opening of the entrance gates. There is in particular provided a detection device, for example constituted by a counting device at the entrance gates or a camera 29 provided for detecting the number of animals in the waiting area 6. When a predetermined number of animals has been reached, it is

possible for ~~the~~ central unit 7 not to allow animals to enter the waiting area 6 until said area is completely empty. For that purpose the detection device supplies a detection signal to the central unit 7.

5 It is noticed that the camera 29 (and possibly other cameras) is not only adapted to determine the number of animals in the waiting area, but also to determine the behavior of the animals, for enabling updating of the data in the memory if desired.

10 When the limited, predetermined number of animals is present in ~~the~~ waiting area 6, ~~the~~ central unit 7 will control the entrance to ~~the~~ milking parlour 4. Also in this case an animal can choose between several exit gates 21, 22, ~~and~~ 23. ~~the~~ Central unit 7 opens one of these exit gates, ~~and~~ <sup>based on</sup> ~~on~~ <sup>for example,</sup> ~~the basis of~~ data regarding milking history and hierarchic order, so that the waiting time per animal does not increase in an undesired manner. For that purpose there is provided a reading unit 13. When an animal <sup>need</sup> ~~has~~ not ~~to~~ be milked, or shows an undesired jostling behavior, it is possible for the

15 central unit to control the exit gates and the selection gates 24, 25, <sup>and</sup> 26 <sup>so</sup> ~~in such a manner~~ that an animal is not guided to the milking ~~parlour~~ <sup>compartiment</sup> 4, but to a punishment path 27.

A dairy animal that has been milked by ~~the~~ milking robot 5 can leave ~~the~~ milking ~~parlour~~ <sup>compartiment</sup> 4 through exit gates 25, <sup>or</sup> 34, 35, <sup>or</sup> 36. Also in this situation there are provided a number of gates, <sup>which are</sup> ~~are~~ disposed side by side, because it has appeared that very dominant, jostling animals may wait for milked animals thus preventing them from leaving the milking ~~parlour~~ <sup>compartiment</sup>. Now that there are provided several exit gates, an

25 animal that has been milked is able to choose a free exit gate.

Only when all the animals admitted to the waiting area 6 have been milked, or <sup>in any event</sup> ~~anyhow~~ have left the waiting area and the milking ~~parlour~~ <sup>compartiment</sup>, which can be detected by the reading

units 13 and 15, the entrances to the waiting area <sup>are</sup> ~~opened~~ released. <sup>1</sup>

The gates controlled by ~~the~~ central unit 7 also provide the possibility of punishing an animal for undesired behavior. When for example the presence of an animal at a certain gate is undesirable, said gate can be moved <sup>so</sup> such that the animal is chased away. Furthermore, as described, the animal can further be guided via a punishment path. It is possible <sup>temporarily apply an electric voltage to</sup> to put a gate (or <sup>all</sup> the gates if desired) ~~temporarily under electric tension.~~

Loudspeakers 37 issuing a sound that is unpleasant to animals may be used alternatively or additionally. There may further be used blowing means 38 for chasing animals away from <sup>locations where they are not</sup> undesired places by means of a strong air flow.

A very effective means of punishment is provided by a vehicle 39 moving forward automatically. Said vehicle 39 may for example be controlled by cameras 29, 30, 31 <sup>and</sup> 40 and image recognition programs ~~known per se~~. However, a particularly accurately functioning vehicle 39 is obtained when the animals are provided with an animal identification adapted to be detected by a positioning system for determining the position of the animal, and when ~~the~~ vehicle 39 ~~moving forward~~ automatically <sup>is</sup> controlled at least with the aid of data from the positioning system. For that purpose the vehicle 39 may be provided with an aerial 41. Of course, the vehicle is <sup>also provided with means, a relay</sup> adapted to carry means of punishment.

Due to the fact that ~~the~~ for each feeding trough 32 is adapted to be closed at least with the aid of data from the memory, a correct feeding behavior can be stimulated. When for example <sup>is pushed away by another animal, this can be</sup> pushing away of an animal eating from a feeding trough 32, <sup>is</sup> detected, ~~by~~ by a camera 31 or 30 or by an animal identification <sup>at</sup> in the feeding station 3a <sup>or</sup> 3b, <sup>or other means</sup> the relevant feeding trough 32 can be closed. The animal that <sup>does not</sup> pushes ~~is~~ is then no longer allowed to obtain fodder from the relevant feeding trough 32 and will quickly leave said

feeding trough 32, so that another animal, in particular the animal that has been pushed away, can regain access to ~~the~~ feeding trough 32. With reference to Figures 2 and 3 the functioning of the arrangement at a feeding station will be set ~~out~~ <sup>forth</sup> in further detail.

As described, the actions can be controlled on the basis of data, inputted manually by a farmer, in relation to the hierarchic order and the jostling behavior of the animals.

However, the arrangement may be self-educating, ~~and/or~~ such that the inputted data are updated continuously with the aid of means determining the hierarchic order <sup>and</sup> ~~respectively~~ the jostling behavior <sup>of the animals</sup>. The hierarchic order ~~respectively~~ <sup>and</sup> the jostling behavior is preferably determined by determining the order in which animals of a herd enter respectively leave an area. This can take place by making use of <sup>for example,</sup> a camera or the animal identification. An extremely <sup>accurate</sup> ~~proper~~ indication <sup>of</sup> ~~in relation to~~ the hierarchic order <sup>and</sup> ~~respectively~~ the jostling behavior <sup>are</sup> ~~is~~ obtained by determining the order in which animals of a herd make use of a feeding ~~and/or~~ <sup>or both</sup> drinking station. Also in this situation a camera or the animal identification can be used.

Although only a number of means of punishment are described, it will be <sup>appreciated</sup> ~~obvious~~ that alternative means of punishment may be used, for example a punishment device that is movable from an invisible to a visible position. In this connection there may be ~~taken into account~~ <sup>for example,</sup> an inflatable object, ~~etc.~~ in the form of a cow, a wall or the like, a picture showing a frightening image, a partition wall or guide wall or the like.

Figure 2 shows schematically a part of an embodiment of a feeding station 3a according to an embodiment according to the invention. At ~~the~~ feeding station 3a fodder <sup>or both</sup> ~~or drink~~ (hereinafter to be denoted by feed, by which is meant fodder <sup>or both</sup> ~~and/or~~ drink) is supplied to an animal in



metered portions. ~~The~~ <sup>B</sup>feeding station 3a is provided with a feeding trough 42 <sup>for containing feed</sup>. An entrance opening 44 <sup>provides</sup> ~~gives~~ an animal, <sup>for example,</sup> ~~eg.~~ but not exclusively, a cow, access to ~~the~~ feeding trough 42. An animal identification device 54 <sup>known per se</sup> is preferably disposed at the feeding station 3a and recognizes a particular animal approaching ~~the~~ feeding trough 42 ~~and wishing~~ to make use of it. A feed supplying device 56 supplies a quantity of feed into ~~the~~ feeding trough 42, possibly with the aid of data from the animal identification device 54, the feed from a ~~non-shown~~ feed stock landing <sup>for</sup> ~~in the~~ feeding trough 42 via, <sup>for example,</sup> ~~eg.~~ a ~~non-shown~~ cover and a chute.

~~The~~ <sup>B</sup>Feeding station 3a is thus capable of recognizing a particular animal, <sup>such as</sup> ~~eg.~~ a cow, ~~for example~~ by means of a transponder fitted on or <sup>to</sup> the cow. ~~The~~ feed supplying device 56 is controlled in a <sup>known</sup> ~~manner known per se~~ by <sup>computer</sup> ~~programs~~, ensuring that the correct quantity of feed is supplied to the relevant cow.

A closing means 46 is movable across an entrance opening 44 of ~~the~~ feeding trough 42. When ~~the~~ closing means 46 is moved across the entrance opening 44, ~~the~~ feeding trough 42 is made inaccessible to a particular animal, after which, as <sup>learned from</sup> ~~it has appeared in~~ practice, the animal will of its own accord <sup>leave</sup> ~~release~~ the entrance to ~~the~~ feeding trough 42 for a next animal. In the example shown, <sup>the</sup> closing means 46 is constituted by a plate-like element that is capable of rotating about an axis 60. Said axis 60 may be constituted by an <sup>axis</sup> ~~ax~~ driven by a motor which, as will be described hereinafter, is controlled with the aid of data in relation to the quantity of feed present in the feeding trough.

Figure 3 shows schematically a part of an alternative embodiment of a feeding station 3a ~~to be applied to an embodiment of an arrangement according to the invention.~~ In this embodiment the closing means is constituted by <sup>a</sup> ~~the~~ feeding trough 43 itself which is designed

as a movable one. In the shown situation ~~the~~ feeding trough 43 is rotatably disposed about an axis 59 that may be constituted by a motor-driven axis<sup>la</sup>, said motor being controlled with the aid of data in relation to the quantity of feed present in the feeding trough, as will be elucidated hereinafter. In order to prevent that, in the position in which the feeding trough 43 closes the entrance opening 45, ~~the~~ feeding trough 43 is provided with a wall portion 61 for catching remaining feed. Said wall portion 61 can also act as a feed guide means for feed that is supplied by <sup>a</sup> feed supplying device 55 into ~~the~~ feeding trough 43.

In the embodiments described, the closing means rotates about an axis, the closing means being driven by a motor controlled with the aid of data in relation to the quantity of feed present in the feeding trough. For the purpose of providing, ~~besides~~ <sup>not only</sup> a simple but <sup>also a</sup> reliable construction, ~~also a~~ <sup>and</sup> compact construction, a roll 64 <sup>or</sup> respectively 65 is preferably driven by a motor 62 <sup>or</sup> respectively 63, which roll 64 <sup>or</sup> 65 contacts ~~the~~ closing means 46 <sup>or</sup> respectively 43. According to the invention the feeding stations <sup>one</sup> 3a <sup>or</sup> 3b <sup>or</sup> are provided with a <sup>Corresponding</sup> detection device 58 <sup>or</sup> 57 for detecting, after the supply of a quantity of fodder ~~or~~ <sup>or both</sup> or drink, that at least a part of the quantity of feed from the feeding trough 42 <sup>or</sup> 43 has been removed and for issuing thereupon a signal for operating ~~the~~ closing means 46 <sup>or</sup> 43. Thus it ~~can be prevented~~ <sup>or</sup> that, after an animal has ~~eaten~~ <sup>consumed</sup> at least a part of the quantity of feed, <sup>if</sup> said animal remains standing at the feeding trough 42 <sup>or</sup> 43, by operating the closing means 46 <sup>or</sup> 43 after receipt of a signal from the detection device 58 <sup>or</sup> 57, <sup>The animal will be induced to leave.</sup> <sup>Accordingly,</sup> so an animal that has just made use of the feeding trough is then <sup>induced</sup> <sup>leave</sup> ~~used~~ to release the entrance to the feeding trough. Such a detection device may be constituted for example by a camera capable of giving an estimation of the quantity of feed present in the feeding trough by means of <sup>an</sup> image recognition program~~me~~.

However, <sup>known</sup> the detection device is preferably constituted by a weighing device for weighing the feed present in the feeding trough. ~~Such weighing devices are known per se.~~ With these means it can be determined how much feed a particular animal has used, and also whether remaining feed is present in the feeding unit. ~~the~~ Closing means <sup>are</sup> 46 ~~43~~ <sup>and</sup> ~~to~~ then preferably controlled with the aid of data both from the animal identification device and data from the weighing device, so that the eating behavior of a particular animal can be taken into account. The weighing device is capable of measuring whether or not, after the supply of a quantity of feed into the feeding trough, there is still feed present in the feeding trough, and how much remaining feed is left. As a result thereof the weighing device, for example after detection that there is no more feed present in the feeding trough, can issue a signal for operation of the closing means for closing the feeding trough.

As shown in Figure 2, the weighing device is constituted by a device 58 for determining the degree of pivoting of ~~the~~ feeding trough 42, and for deducing therefrom the weight of the feed present in ~~the~~ feeding trough 42. In this situation ~~the~~ feeding trough 42 is supported by <sup>a</sup> ~~the~~ load sensor 66 via a supporting arm, ~~the~~ feeding trough 42 pivoting about a hinge pin 67.

In the embodiment of Figure 3 the weighing device comprises the movable feeding trough 43 for weighing the feed present in the feeding unit. The feeding trough 43 is moved in a reciprocating manner by <sup>a</sup> ~~the~~ motor 63 driving <sup>a</sup> ~~the~~ roll 65. As a result of this movement there occurs a torque, <sup>the</sup> ~~whose~~ magnitude <sup>of which</sup> is determined by a device 57 for measuring the magnitude of the torque. ~~the~~ <sup>Q</sup> device 57 deduces the weight of the feed present in the feeding trough from the torque determined. The exact correlation between torque and quantity of feed can previously be determined by means of simple calibration tests.

The Detection device 58A 57 preferably <sup>include</sup> comprises a clock, so that it is possible to measure how long the quantity of (remaining) feed in the <sup>corresponding</sup> feeding trough 42A 43 remains untouched. By setting for example an upper threshold, after said upper threshold has elapsed, <sup>that is</sup> after a predetermined threshold <sup>period of</sup> time has elapsed, the clock can issue a signal for closing <sup>or</sup> the closing means 46A 43. In particular when data from the weighing device and the clock are combined, an extremely efficient use of the feed metering device is possible. This makes it possible for example to use <sup>for each</sup> ~~per~~ animal a combination of data in relation to a lower threshold for remaining feed and an upper threshold for the time for operating <sup>the corresponding</sup> the closing means 46A 43. Thus the closing means ~~is~~ <sup>are</sup> operated when less than the lower feed threshold is present in ~~the~~ feeding trough 42A 43 longer than the threshold time. As a non-limiting example ~~can be taken~~ approximately 2% to 10% of the quantity of feed supplied by the feed supply device to the feeding trough <sup>may be</sup> as a threshold for the quantity of remaining feed, and approximately <sup>ten</sup> ~~to~~ to <sup>sixty</sup> ~~60~~ seconds as a threshold time.

The embodiments of a feed metering device shown in Figures 2 and 3 are provided with a <sup>device</sup> ~~device~~ 48A 47 for detecting jamming for ~~the~~ closing means 46A 43. Thus it is prevented that an animal is injured during closing of the entrance opening to the feeding trough. A <sup>known</sup> ~~device~~ device for detecting jamming ~~is known per se~~ <sup>is known</sup> for example, with <sup>for</sup> automatically closing car windows. When the device for detecting jamming detects a jamming, said device ensures by controlling the closing means that the latter releases the entrance gate. Preferably the closing means is re-closed automatically after a short time, <sup>just as</sup> ~~eg~~ less than <sup>two</sup> ~~2~~ seconds. When an animal does not release the feeding trough after the first closing of the closing means, the closing means will repeat the closing action until the entrance opening is

completely closed. When the closing means continues to open and close, there may have <sup>be</sup> occurred a defect. Consequently it is advisable to ~~perform closing of the closing means~~ a maximum number of times <sup>for</sup> an alarm signal <sup>to be</sup> issued after <sup>a select</sup> ~~the~~ maximum number <sup>of anti-jostling openings</sup> has been reached. Said alarm signal may be audible, visible or otherwise.

~~an~~ Obstacle detector <sup>or</sup> 50A 49 <sup>are</sup> provided for detecting an obstacle in the entrance opening. Such an obstacle detector <sup>and</sup> 50A 49 <sup>are</sup> preferably suitable for distinguishing animals and other objects from each other. For that purpose, the combination <sup>of same</sup> with the animal identification device is advantageous, although image recognition equipment is possible as well. An obstacle could for example be constituted by the hand of a person cleaning the feeding trough, it ~~then~~ <sup>is present</sup> being ~~detected~~ that the closing means must not be closed when the hand is present in the entrance opening.

The embodiments of the invention according to Figures 2 and 3 also comprise an anti-violence detector <sup>and</sup> 52A 51 for detecting undesired kicking, knocking or the like against ~~a part~~ <sup>and</sup> of ~~the~~ feeding station <sup>for example,</sup> 3aA 3b. When the anti-violence detector <sup>and</sup> 52A 51, which may comprise <sup>when a part is</sup> a vibration detector, detects that there <sup>is</sup> ~~is~~ knocked or the like against a ~~part of the feeding station~~, then said detector issues a signal for operating <sup>the</sup> closing means <sup>or</sup> 46A 43 for closing the feeding trough <sup>one</sup> 42A 43.

There is preferably provided a device for issuing a warning signal, <sup>such as</sup> ~~is~~ a sound signal ~~and/or~~ a light signal, <sup>or both,</sup> indicating closing of the closing means, so that the animals are warned of closing.

Not only jostling animals may cause a disturbance of the normal order of things at a feeding station, but also so-called gourmets may cause a disturbance. A gourmet is an animal going from one feeding trough (or feeding station) to another and each time only takes a small quantity of fodder (usually the best part). Such a disturbance is avoided

according to the invention in that the computer is programmed  
 in such a manner that the closing means of a third feeding  
 trough is operated when the data in the memory indicate that  
 an animal has taken within a predetermined period of time  
 5 less than a first quantity of feed from a first feeding  
 trough and less than a second quantity from a second feeding  
 trough. The first ~~or~~ <sup>or both,</sup> second quantity, preferably ~~amounts~~ <sup>being</sup>  
<sup>about</sup> to 0.75 ~~kg~~ <sup>kilograms</sup> (another quantity ~~is~~ <sup>being</sup> possible ~~as well~~), while the  
 period of time preferably amounts to ~~15~~ <sup>fifteen</sup> minutes (another  
 10 period of time ~~is~~ <sup>being</sup> possible ~~as well~~).

Although we have disclosed the preferred embodiments  
 of our invention, it will be understood that it is capable  
 of other adaptations and modifications within the  
 scope of the following claims